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INDIAN TERTIARY AND POST-TERTIARY VERTEBRATA.

Vol. III.

Part 3. RODENTS & NEW RUMINANTS FROM THE SIWALIKS,

AND

SYNOPSIS OF MAMMALIA.

By R. LYDEKKER, B.A., F.G.S., F.Z.S.,

WITH 1 PLATE AND 8 WOODCUTS.

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ERRATUM AND ADDENDUM.

Page 109, top line, for *miocene* read *pliocene*.

Hystrix major, Gervais (*Vide* "Zool. et Pal. Generales," ser. 1, p. 79) is omitted from the fossil species mentioned on p. 109. It differs from *H. cristata* merely by its superior size, and may not improbably be a larger race of that species.

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RODENTS & NEW RUMINANTS FROM THE SIWALIKS,

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SYNOPSIS OF MAMMALIA.

By R. LYDEKKER, B.A., F.G.S., F.Z.S.

(WITH PLATE XIII.)

Order: RODENTIA.

Rarity of remains.—The remains of rodents from the Indian tertiaries are of rare occurrence; this being probably due to the small size of most members of the order. No remains of rodents are figured in the "F.A.S.;" neither were any described by Falconer, although more than one genus was known to him from the Siwaliks. A species of *Siphneus (S. arvicolinus)* has recently been described by Herr Nehring[1] from the deposits of the upper Hwangho river in China, which probably correspond either to the Siwaliks or Narbadas.[2] The living species of that genus occur in North China and the Altai; and the fossil form is said to connect the living species with *Arvicola*.

SUB-ORDER: SIMPLICIDENTATA.

FAMILY I: *MURIDÆ.*

In a memoir by the late Gen. Sir W. E. Baker,[3] it is stated that remains of *Mus* had been obtained from the Siwaliks; and the same statement is made in Falconer's notes.[4] In the Indian Museum there is a fragment of breccia from the Narbadas containing the incisors of a murine rodent, of which the generic determination seems impossible.

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[1] "Sitz. Ges. nat. Freunde, Berlin." 1883. p. 19

[2] *Vide supra*, vol. II. p. 289.

[3] "On the Fossil Remains presented to the Museum at Ludlow" (Ludlow, 1860) p. 16.

[4] "Palæontological Memoirs," vol. I., p. 23. See also 'Journ. As. Soc. Beng.' vol. IV., p. 706, V., p. 296.

FAMILY II.: *SPALACIDÆ.*

GENUS: RHIZOMYS, Gray.

Distribution and number of species.—According to Dr. G. E. Dobson,[1] the genus occurs in China, Tibet, the Malay Peninsula, and Eastern Africa; and Dr. J. Anderson[2] gives the following list of species from India, China, etc., *viz.:*

RHIZOMYS BADIUS, Hodgson. India and Burma.
,, ERYTHROGENYS, Anderson. Burma and Tenasserim.
,, MINOR, Gray. Burma, Martaban, etc.
,, PRUINOSUS, Blyth. Eastern Asia.
,, SINENSIS, Gray. China.
,, SUMATRENSIS (Raffles). Sumatra.

The form described below is the only known fossil species.

Species: RHIZOMYS SIVALENSIS, *nobis.*

Syn (?) *Typhlodon*, Falconer.

History.—This species was briefly described by the present writer[3] in 1878 on the evidence of two rami of the mandible, one of which was subsequently figured.[4] It was suggested that the generic name *Typhlodon*, Falconer,[5] might probably have been assigned to the present form; its derivation from the allied *Spalax typhlus* being so obvious. This suggestion is confirmed by the fact that Siwalik specimens of the present form are preserved in the British Museum.

Mandible.—In the accompanying woodcut (fig. 1) there is given an enlarged view of the dental aspect of the left ramus of a mandible, collected by Mr. Theobald in the Siwaliks of the Punjab. Only the two last molars remain, the crown of m. 1 having been broken off. A portion of the incisor still remains on the lower border; and the two molars are in an early stage of wear. In woodcut fig. 2, there are represented two portions of the right ramus of the mandible of a species of the same genus. The first specimen (A) is viewed from the inner aspect, and shows the second and third molars, the crown of m. 1 having been broken off. The second (C) is viewed obliquely from the outer and upper aspects, and shows the three molars in a well-worn condition. Both were obtained by Mr. Theobald from the Siwaliks of the Punjab. The molars of these two specimens are rather smaller than those of the specimen represented in fig. 1, and the depth of the

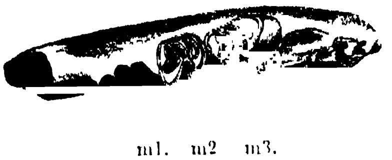

Fig 1 *Rhizomys sivalensis*. Part of the left ramus of the mandible, from the Siwaliks of the Punjab. Indian Museum (No D 97) ½

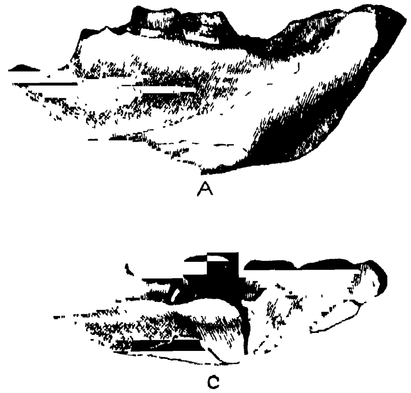

Fig. 2. *Rhizomys*, sp. Two specimens of part of the right ramus of the mandible, from the Siwaliks of the Punjab Indian Museum (Nos D 97a, 97b.) $\frac{3}{2}$

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[1] "Encyclopædia Britannica," 9th ed , Art "Mammalia," p. 419.

[2] "Anatomical and Zoological Results of the two Expeditions to Yunnan, p. 322 (1878).

[3] 'Records,' vol. XI., p 100.

[4] *Ibid.*, vol, XII., p. 52.

[5] "Palæontological Memoirs," vol. I., p. 23.

jaw is somewhat less; but as the three specimens are otherwise very similar, it seems best to regard them as belonging to the same species. In the British Museum there are two rami of the mandible of a fossil rodent from the typical Siwaliks, of slightly larger size than the largest Punjab specimen, but evidently belonging to the same genus. The general characters of those specimens are very similar to those of the Punjab specimens, and, although it is possible that their superior size may indicate specific distinction, they may be provisionally associated. The following table exhibits the dimensions of the molar series of three of the above-mentioned specimens, viz.:

	Ind. Mus		Brit Mus.
Length of three molars	0·62	0 67 (?)	0.74
Width of m 2	0 17	0·2	0·25
Vertical diameter of incisor	0 16	0·16	0 17

The number and structure of the cheek-teeth (fig. 1), which have a deep enamel-fold on the outer, and three minor folds on the inner side, two of which (fig. 2) persist as isolated fossettes on the crown of well-worn teeth, show that the specimens belong to the sub-family *Spalacinæ* of the *Spalacidæ*. This sub-family contains the three genera[2] *Spalax*, *Heterocephalus*, and *Rhizomys*. The lower molars of the first are distinguished by the enamel-folds being very shallow, and disappearing at an early stage of wear; while those of the second have only a single inner and outer fold. In *Rhizomys* the structure of the molars is precisely similar to that of the Siwalik specimens, and the latter may therefore be referred to that genus.

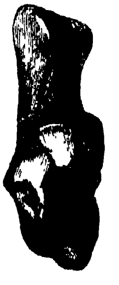

Fig 3. *Rhizomys*. (?) sp Left calcaneum, from the Siwaliks of the Punjab Indian Museum (No. D 98) $\frac{2}{1}$

Calcaneum.—In woodcut fig. 3 there is given an enlarged view of the left calcaneum, partially broken on the inner side, of a small mammal collected by Mr. Theobald in the Siwaliks of Asnot, which may not improbably belong to the present form. The bone is very similar to, but somewhat smaller than the calcaneum of *R. badius.*

Distinctness and Affinities.—Taking the specimen represented in fig. 1 as the type, the Siwalik form is distinguished from *R. sumatrensis* by the smaller size of the jaw and the incisor, although the length of the molar series is very nearly the same in the two; the individual teeth being wider in the living form. The fossil is nearer in size to *R. pruinosus*, but its molars are more elongated, the incisors much smaller, and the jaw more slender. It is considerably larger than *R. badius*, and still more so than *R. minor*; but the incisors are only a little larger than those of the former, although the molars are half as large again. *R. sinensis* and *R. erythrogenys* are both considerably smaller than the fossil. The writer has not had the opportunity of comparing the latter with the African form; but it is in all proba-

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[1] In the preliminary notice already quoted it has been conclusively shown that the specimens cannot belong to any other family. The memoir by E. R Alston on the "Classification of the Order Glires" ('Proc Zool Soc,' 1876, p 61), exhibits the dental character of the different groups in a very clear manner.

[2] *Myospalax*, Blyth (not Brandt, which—*Siphneus*), has been shown by Mr. W. T. Blanford ('*Journ. As. Soc. Beng.*,' vol L, pt. 2, p. 118) to be probably identical with *Ellobius*, and does not, therefore, belong to the *Spalacidæ*.

bility distinct. In all the recent forms the molars are relatively wider than those of the fossil.

It appears, therefore, that the Siwalik *Rhizomys*, whether it comprehends one or more species, is probably distinct from any of the living forms; and it may accordingly retain the provisional name, *R. sivalensis*. The relatively wider molars and the larger size of the incisors of the existing forms as compared with those of the fossil seem to indicate that specialization has tended to the production of these characters.

Distribution.—Remains of the Siwalik *Rhizomys* have been obtained from the typical Siwalik Hills and the Punjab.

FAMILY III.: *HYSTRICIDÆ.*

Dental Characters.—According to the late Mr. E. R. Alston[1] the living members of the *Hystricidæ* present the following dental characters, *viz.*:

- *A.* SPHINGURINÆ. Cheek-teeth rooted. Nearctic and Neotropical.
  - *Chætomys*, Gray. Upper cheek-teeth each divided into three lobes, of which the first and last have deep single enamel-folds; lower teeth with an external and two internal folds.
  - *Synetheres*[2] F. Cuv. Cheek-teeth like *Chætomys*, but with two lobes only: equal in size.
  - *Erethizon*, F. Cuv. Cheek-teeth like *Synetheres*, but anterior larger than posterior.
- *B.* HYSTRICINÆ. Cheek-teeth, semi-rooted, Palæarctic, Indian, and Ethiopian.
  - *Ather[illegible]* G. Cuv. Upper cheek-teeth with one internal, and three or four external e[illegible]l-folds, the latter soon separated into enamel-loops: lower teeth similar bu[illegible]ersed.
  - *Hystri[illegible]*, [illegible]nn. Teeth as in *Atherura*.

It thus appears that while the American porcupines can be distinguished palæontologically from those of the Old World, the genera *Atherura* and *Hystrix* cannot be distinguished by characters usually available in the case of fossils. The cheek-teeth of *Dasyprocta* are also very similar to those of the smaller porcupines; but none of the species of that genus, or *Atherura*, attain such a large size as some species of *Hystrix*.

GENUS: HYSTRIX, Linn.

Distribution, and number of fossil species.—The genus is confined to the Old World at the present day; but in former times it apparently ranged into America, if *Hystrix venusta* be rightly determined. It will be unnecessary to give a list of the existing species; but it may be mentioned that the South European and African *H. cristata*, Linn., and the Indian *H. hirsutirostris*,[3] Brandt, are the largest forms. The earliest recorded occurrence of a porcupine, or allied form, is in the "Quercy Phosphorites," from which deposits a fragment of a mandible has been described by Dr. Filhol[4] under the name of *H. (?) lamandini*. Besides this there is the so-called

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[1] *Op. cit.*

[2] Syn. *Cercolabes*, Brandt. *Sphingurus*, F. Cuvier.

[3] Syn. *H. leucura*, Sykes.

[4] "Phosphorites du Quercy" (reprint) p. 49.

H. refossa, Gervais[1] from the miocene of Issoire; referred by Bravard[2] to *Dasyprocta*; *H. primigenia*[3] (Wagner) from the Pikermi group; and *H. venusta*, Leidy,[4] from the pliocene of North America. An unnamed form has also been obtained from the pliocene of the Val d'Arno; and another from Sicily.[5]

Species: HYSTRIX SIVALENSIS, *nobis*.

History.—The occurrence of a Siwalik porcupine is mentioned in the memoir by Sir. W. E. Baker already quoted, and in Falconer's notes.[6] A fragment of a mandible has been noticed by the present writer under the name of *H. sivalensis.*[7]

Mandible.—The above mentioned fragment of the mandible is represented in the accompanying woodcut (fig. 4), and was obtained by Mr. Theobald from the Siwaliks of the Punjab. It consists of the middle portion of the right ramus, and shows m. $\overline{1}$ and m. $\overline{2}$ in a middle stage of wear; the crown of pm. $\overline{4}$ has been broken off, and m. 3 has fallen from its alveolus, which is filled with matrix. The specimen is considerably larger than the jaw of *H. hirsutirostris*, and it is, therefore, evident that among the living forms it is only necessary to compare it with that species and *H. cristata*. The structure of the cheek-teeth is of the same complex nature as those of the living species. The broken base of pm. 4 shows, however, that this tooth was inserted by three distinct roots;[8] which from the state of wear of m. 1 must evidently have been situated only just below the lower extremity of the external enamel-fold. In the existing species the roots of this tooth are never so distinctly developed as in the fossil, and are situated at a distance of more than half-an-inch below the latter fold. The alveolus of pm. 4 in a jaw of the existing species in the same stage of wear, exhibits a large single cavity, without the slightest trace of any division. Precisely similar conditions prevail in the true molars, the roots being distinctly visible on the outer side of m. 1,[9] in which there is an interval of less than a quarter-of-an-inch between their commencement and the inferior extremity of the external enamel-fold, the same interval being more than half-an-inch in length in the smaller tooth of *H. hirsutirostris*. In consequence of the short crowns of the cheek-teeth the hinder part of the incisive alveolus is placed

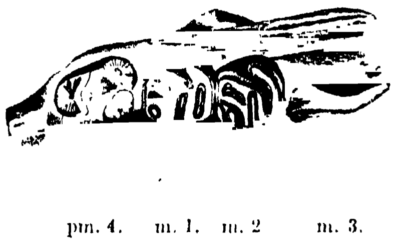

Fig. 4. *Hystrix sivalensis.* Fragment of the right ramus of the mandible, from the Siwaliks of Asnot, Punjab. Indian Museum (No D 96).

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[1] "Zoologie et Paléontologie Françaises," 2nd ed, pp. 17, 18, pl. XLVIII, fig 11.

[2] *Vide* Pomel, "Cat. Meth. Vert. Foss.," p. 32.

[3] *Vide* Gaudry, "Animaux Fossiles et Géologie de l'Attique," p 122, pl. XVIII, fig. 2.

[4] "Extinct Mammalian Fauna of Dakota and Nebraska," '*Journ. Ac. Nat. Sci. Philadel,*' ser. 2, vol. VII, p. 343, pl. XXVI., fig. 23 (1869).

[5] *Vide*, Gaudry, *op. cit.* p 126

[6] "Pal. Mem" vol. 1, p 23

[7] "Records," vol XI, p. 100, (1878).

[8] The large size of the alveolus of this tooth, and the well-worn condition of the true molars, shows that the former could not have been a milk-molar.

[9] The crown of m. $\overline{1}$ accidentally broke off during description, when the roots were very distinctly exhibited.

nearer to the superior surface of the ramus than in the existing species. The mental foramen is placed nearer pm. 4, the depression of the superior surface of the ramus in front of that tooth is less deep, and the ridge forming the anterior boundary of the masseteric fossa is more strongly developed.

In its large size, as well as in the position of the mental foramen, and the strong development of the masseteric ridge, the fossil agrees with the Pikermi *H. primigenia.* In all other respects that species appears to be very close to *H. cristata*, and differs, therefore, in the same characters from the Siwalik fossil. *H (?) lamandini* is named upon the evidence of a fragment without the teeth, and in the absence of a figure cannot be compared with the present specimen. *H. refossa* is apparently only known by a fragment of the mandible containing one molar, and the alveolus of another: it is said to be distinguished from *H. cristata* by the more numerous enamel-islands on the worn crowns of the molars. It apparently agrees with the Siwalik form in having very distinct roots and short crowns to the molars; but these teeth are of a more elongated form. *H. venusta* is founded on a single molar, which is said to resemble the corresponding tooth of *H. cristata.* It appears, however, to have had a short crown, with distinct fangs. It is impossible to say whether it is the same as the Siwalik fossil; although this is improbable. There are no means of comparing the Siwalik specimen with the unnamed fossils from the Val d'Arno and Sicily.

Young skull.—In the accompanying woodcut (fig. 5) there is represented the cranium of a young Siwalik porcupine in the British Museum which not improbably

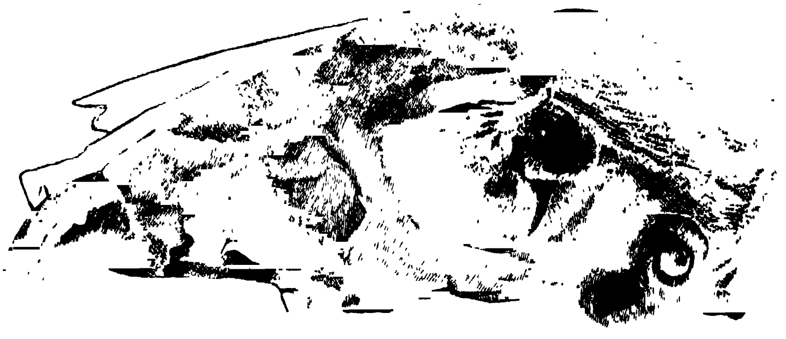

Fig 5 *Hystrix* sp. Left lateral aspect of the cranium of a young individual from the Siwalik Hills, with the nasals restored British Museum (No 15,923). $\frac{1}{1}$.

belongs to the same species as the mandible. The specimen is believed to be one of those collected by Baker and Durand; and has the mandible (in a crushed condition) attached, which has been omitted from the figure. The cranium has suffered considerably from crush, and has lost the nasals and a part of the maxilla. In the upper jaw there are only two teeth, and but three in the lower; thus showing that the specimen is not adult. The first tooth in each jaw is the milk-molar, and the second the first true molar. On the left side of the mandible the whole length of the crown of m. 1 is exposed; and it is thus seen that in its lower part the dimensions of this tooth are similar to those of the corresponding tooth of the specimen represented in fig. 4. In the same tooth the external enamel-fold extends as near down to the root as in the latter specimen; and there is accordingly a great probability that the two specimens belong to the same species. The young cranium is very similar in general contour to the cranium of *H. hirsutirostris* and *H. cristata*, having the characteristic convex profile; which is wanting in the smaller porcupines.

Distinctness and affinities.—The foregoing comparisons lead to the conclusion that the Siwalik porcupine is specifically distinct from all the living species of the genus, while it is probably also distinct from the described fossil forms, though apparently coming nearest, in one respect, to *H. refossa*, and perhaps to *H. venusta*. The characters in which the Siwalik form differs from the existing species are precisely those which might be expected to occur in an early, or generalized, form, and it is therefore quite possible that it may be the ancestor of the large existing Indian species. The provisional name *H. sivalensis* may be retained for the Siwalik species.

Distribution.—If both the specimens described above belong to the same species, the range of that species extended from the typical Siwalik Hills to the Punjab.

Order: UNGULATA. Sub-Order: ARTIODACTYLA.

Section: RUMINANTIA.

Introductory.—In the preceding volumes of this work[1] most of the Siwalik ruminants have been described and figured. The present part contains descriptions of a few new forms, and a revision of some of those previously described

The retention of the generally discarded term Ruminantia, as comprehending the modern Pecora, Tylopoda, and Tragulina, is adopted in view of the difficulty of referring many of the fossil forms to one or other of those groups. That the term Ruminantia is incapable of definition the writer is fully aware; but as all divisions in palæontological zoology must be arbitrary in cases where a large number of forms belonging to allied groups are known, and as it is highly desirable to divide the Artiodactyla into a more specialized and a less specialized group, no valid objection to the use of the term can be drawn from this source.

Family: *BOVIDÆ.*[2]

Genus: OREAS, Desmarest.

Distribution.—The genus is confined at the present day to south and tropical Africa, and includes only two species. It has not hitherto been recorded in a fossil condition.

Species: Oreas (?) latidens, *nobis.*

Syn. *Cervus latidens*, *nobis.*

History.—In the first volume of the present work,[3] an upper and lower molar of a large ruminant from the the Siwaliks of the Punjab were described and figured under the name of *Cervus latidens*, with a proviso as to the possible incorrectness of the generic name. In the preface to the same volume,[1] the doubtfulness of this point was again mentioned. The more extended means of comparison now available to the writer have pretty conclusively shown that these specimens do not belong to the *Cervidæ*.

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[1] Vol. I., pts 2, 3, 4. Vol. II., pts. 4, 5.

[2] In accordance with Prof. Flower's classification this family is taken to include all the cavicorn ruminants except *Antilocapra.*

[3] Page 65, plate VIII., figs. 4, 6, 7, 10 (1876).

Upper dentition.—In plate XIII., fig. 12, of the present volume, there is represented the external aspect of the left maxilla of a large ruminant collected by Mr. Theobald in the Siwaliks of the Punjab, containing the last two premolars and the three true molars, in an intermediate state of wear. Part of the outer surface of m. 2 is somewhat damaged, and the masticating surfaces of this and the succeeding tooth are so injured that they could not be figured; but a figure (fig. 13) has been given of this aspect of the three preceding teeth. The true molars of this specimen correspond exactly in form with the type tooth represented in vol. I., pl. VIII., figs. 7, 10, but are of somewhat smaller size; this difference cannot, however, in all probability, be regarded as of more than individual, or sexual, value.

In no species of *Cervidæ* which has come under the writer's observation are the outer surfaces of the true molars so flat as in the specimens under consideration, or is the middle 'costa' of each lobe so faintly developed; neither are the hinder costæ on the outer surface of pm. 4 so little prominent. These differences are so important as to indicate that the specimens do not belong to that family.

From *Bos* and its allies the specimens are readily distinguished by their more 'brachydont' character, the flatness of the outer surfaces of the molars, and the slight development of cement.

Turning to the larger antelopes, the teeth of the maxilla under consideration agree so closely with those of *Oreas canna* that there can be little or no doubt but that they indicate a closely allied form. The teeth of the specimen are about one-fourth smaller than those of a large male eland; but the single tooth figured in the first volume is very nearly the size of the latter. The fossil teeth can only be distinguished from these *O. canna* by the larger development of the accessory column in the median valley (which is very minute in the living species) and by pm. 3 being relatively rather longer. The teeth of the kudu (*Strepsiceros*) present a strong resemblance to those of the eland, but are distinguished by their lower crowns, the total absence of the accessory columns in the median valley, the smaller development of the anterior costa of the first lobe, and of the costæ on the last two premolars. In all these respects they are unlike the fossil. All three agree in the smoothness of the enamel. The teeth of *Alcelaphus*, *Connochœtes*, and *Boselaphus* are of a different type, and those of no other existing antelopes come so near to the fossil as do those of *Oreas*.

Turning to other fossil forms, it may be stated that the present teeth are unlike those of any other previously described Siwalik species. Of the European forms, those which come nearest to the present specimens are the Pikermi *Palæoryx pallasi* and *Tragoceros amaltheus.*[1] According to Prof. Gaudry[2] the molars of those two species are, in a long series, almost indistinguishable, although the figures appear to show considerable differences. The molars of *Palæoryx*, as far as can be judged from the figures, have lower crowns than those of the present specimen, with the costæ less strongly developed (especially the last costa[3] of m. 3), the middle of the outer surfaces of the lobes less perfectly flat, and the accessory columns less strongly developed, although, according to Prof. Gaudry, there is a considerable amount of variation in this respect. In *Tragoceros* the costæ appear slightly more developed than in *Palæoryx*, but not so strongly as in the present specimen; this smaller development never admitting of the worn surface of the first costa of the posterior lobe being directed forwards as in m. 1, fig. 13. In *Tragoceros*, as in *Palæoryx*, the costæ unite at the 'neck' of the crown to form a kind of cingulum. Finally the outer surface of $\underline{\text{pm. 4}}$[4] in *Tragoceros*, and in a slightly less degree in *Palæoryx*, is apparently more symmetrical than in the present specimen; the middle costa being placed more nearly in the median line. Both the Pikermi genera resemble the Siwalik jaw in their elongated $\underline{\text{pm. 3}}$.

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[1] Page xvii.

Lower molar.—The lower molar represented in vol. I., pl. VIII., figs. 4, 6, so closely resembles the upper one figured in the same plate, that it may be safely referred to the same species. It closely resembles the corresponding tooth of the eland.

Distinctness and affinities.—The teeth of allied genera of ruminants are frequently so similar in general structure that it is a matter of extreme difficulty to deduce from them alone the generic affinities of their owners; and all determinations from such evidence must be made with extreme caution. The foregoing comparisons indicate, however, pretty conclusively that the teeth under consideration belonged to a large antelope, of which the largest individuals were nearly equal in size to the largest eland; and that this antelope was most nearly allied to *Oreas*, *Palæoryx*, and *Tragoceros.* On the whole, its relationship appears to be decidedly nearest to the first of those three genera (although it is quite possible that it may really be generically distinct); and it may, therefore, be perhaps admissible to refer it provisionally to that genus, until more complete remains shall be obtained.

Admitting the probability of the present form being very intimately related to *Oreas* and the larger Pikermi antelopes, its existence in the Siwaliks is a matter of much interest, as it is one more instance of the intimate union that formerly existed between the faunas of India, Africa, and southern Europe.

Distribution.—All the known remains belonging to the present form were obtained from the Siwaliks of the Punjab.

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[1] Gaudry, "Animaux Fossiles et Géologie de l'Attique," pls. XLVII.-IX.

[2] *Op. cit.*

[3] Compare pl. XLVII., fig. 3, of Prof. Gaudry's work.

[4] $\underline{\text{Pm. 3}}$ in Prof. Gaudry's figures.

GENUS: PALÆORYX, Gaudry.

Distribution.—Two species, *P. pallasi* and *P. parvidens*, have been determined from Pikermi,[1] and a third, *P. meneghinii*, has been recorded by Prof. Rütimeyer[2] from Italy.

PALÆORYX (?) sp.

History.—In the preface to the first volume of this work[3] it is stated that two molars from the Siwaliks may possibly belong to the present genus.

Upper molar.—One of the above-mentioned teeth (both of which came from the Punjab) is represented in pl. XIII., figs. 9, 10: it belongs to the left side, and is about one-third worn. It differs from the molars of *Oreas* (?) *latidens* (figs. 12, 13) by the crown being lower, which causes the outer surfaces of the lobes to be relatively wider; by the slighter development of the costæ (especially the last costa of the hinder lobe), and by their union at the 'neck' to form an imperfect cingulum (*not well shown in the figure*). It also differs by the more rugose enamel, the less perfect flatness of the outer surfaces of the lobes, and the compressed form of the accessory column in the median valley, which is attached entirely to the posterior 'crescent.' In all these respects this tooth agrees with the molars of *Palæoryx* and *Tragoceros*; but seems to come nearest to the figured specimens of the former, although having a larger accessory column: the size of this column is, however, so inconstant in the European form that it cannot be regarded as of generic value. Whether the present specimen really belongs to *Palæoryx* may be considered doubtful; but it pretty certainly indicates a closely allied form, and a second species of large Siwalik antelope.[4]

GENUS: BOSELAPHUS, Blainville.

Syn. *Portax*, H. Smith.

Number of species.—The genus is exclusively Indian; comprising the existing *B. tragocamelus*[5] (Pall.), the pleistocene *B. namadicus* (Rütimeyer), and the Siwalik form described below.

BOSELAPHUS, sp.

History.—In 1878 Prof. Rütimeyer[6] described two portions of the cranium of a ruminant from the Narbadas, under the name of *Portax namadicus*: that species being distinguished from the living form by the closer approximation of the horncores to the orbits. The first notice of the occurrence of a species of this genus in the Siwaliks is in the first volume[1] of the present work, where some teeth and jaws are briefly mentioned under the name of *Portax*. In a subsequent notice[2] a fore-limb from the Siwaliks of the Punjab was also referred to the same genus; but no specific name was assigned in either case.

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[1] *Op. cit.*, pl. XLVII.

[2] "Die Rinder der Tertiar-Epoche," p. 87 ('Abh. schweiz. pal. Gesel,'—1877-8).

[3] Page xv. (1880).

[4] In the British Museum there is a part of the right maxilla of a ruminant (No. 16,657) from the Siwalik Hills, containing the last five cheek-teeth, which probably indicates a third species of large antelope. The last molar is nearly as large as in the figured jaw of *Oreas* (?) *latidens*, but the two preceding molars and the two premolars are very much smaller. The teeth come nearest to those of that form; but the first costa of the second lobe is less, and the last costa much more strongly developed: the accessory columns in the median valleys are somewhat larger.

[5] Syn. *B. pictus* (Pall.).

[6] "Die Rinder der Tertiar-Epoche," page 89, in 'Abh. schweiz. pal. Gesel,' vol. V.

Upper dentition.—In plate XIII., fig. 1, there is represented the masticating and inner aspect of the cheek-teeth of the left maxilla of a ruminant collected by Mr. Theobald in the Siwaliks of the Punjab. The specimen belonged to a young individual and shows the three milk-molars (mm. 2, mm. 3, mm. 4) in a well-worn condition, and the first and second true molars (mm. 1, mm. 2) in an early condition of wear, and not fully protruded. In figure 2 there is represented the external aspect of the teeth of a precisely similar left maxilla, from the same locality, containing mm. 3, mm. 4, and m. 1.

It will suffice to say that the teeth of these specimens correspond so exactly with the homologous teeth of a young female individual of *Boselaphus tragocamelus* that there can be little hesitation in referring them to the same genus.[3] The only difference that can be detected between the recent and fossil teeth is that the latter are of considerably larger size, and that the central enamel-pits of the true molars are less deep, while the hinder wall of the posterior 'crescent' of m. 2 is somewhat lower, thus causing the union of the dentine surface of this 'crescent' with that of the corresponding 'lobe' to be somewhat later. The lesser depth of the middle enamel-pits causes the lip of the 'crescents' of the fossil teeth to be thicker than in those of the living species. In the following table the dimensions of the fossil teeth are compared with those of the above-mentioned skull of *B. tragocamelus*, *viz.*:—

	Fossil.		B. tragocamelus.
Length of five teeth	4 65		3 73
,, ,, mm. 2	0·83		0·67
,, ,, ,, 3	0·92	0·94	0·78
,, ,, ,, 4	0·9	0·92	0·72
,, ,, m. 1 . . . . , .	1·1	1·11	0·97
,, ,, ,, 2	1·19		1·05

In figure 7 of the same plate there is represented a well-worn left upper true molar, from the Siwaliks of the Punjab, in which the greater part of the accessory column in the median valley has been broken away. The tooth of which two views are given in figures 8, 11 of the same plate is an almost unworn right upper true molar, from the same locality. In this specimen, as in m. 1 of fig. 2, the first costa of the anterior crescent is less strongly developed than in the true molars of fig. 1; but it is probable that this difference is merely of individual value.

Lower dentition.—In plate XIII., fig. 5, there is represented a fragment of the left ramus of the mandible of a large ruminant, collected by Mr. Theobald in the Siwaliks, which from its size and the resemblance of its teeth to those of the nilgai may be referred to the present species. This specimen contains the three true molars in a well-worn condition; and is distinguished from the mandible of the living species merely by its superior size, and the lesser depth of the median enamel-pits. The dimensions of this specimen are as follows, *viz.*:—

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[1] Page xv. (1880). [2] "Records," vol. XVI., p. 76.

[3] The molars of *Hippotragus* are very similar to those of *Boselaphus*, but have the borders of their outer surfaces more nearly parallel.

Length of three true molars .	3·25	Length of m. 3	1·4
,, ,, m. 1	0·85	Depth of jaw at m 3	1·87
,, ,, ,, 2 . .	0 95		

There are numerous similar specimens in the Indian Museum from the Siwaliks of the Punjab, and one or two from the typical Siwalik Hills. In fig. 3 of the same plate there is represented part of the dentition of the right ramus of the mandible of a young individual, showing the well-worn $\overline{\text{mm.}\ 3}$ and $\overline{\text{mm.}\ 4}$, and $\overline{\text{m.}\ 1}$ very slightly worn: the inner portions of the lobes and parts of the crescents of the last two teeth have been broken away. In figure 4 of the same plate there is represented a portion of the left ramus of the mandible of a still younger individual, showing the three milk-molars in an early stage of wear, and the summit of the first lobe of $\overline{\text{m}\ 1}$, which had not cut the gum. Both these specimens were obtained by Mr. Theobald from the Siwaliks of the Punjab; and so closely resemble young mandibles of *B. tragocamelus* that they may be referred to the present species. The only essential difference between the living and fossil form is the superior size of the latter.

Limb-bones.—From the Siwaliks of Niki in the Punjab Mr. Theobald, as already mentioned, obtained a nearly complete right fore-limb, and part of the associated ramus of the mandible, and axis vertebra of the present species, which are now in the Indian Museum (No. B. 268). The fragment of the mandible agrees precisely with the one represented in plate XIII., fig. 5; and the limb-bones are so like those of the nilgai that it has not been considered necessary to figure them. The radius is one inch longer than the corresponding bone of the skeleton of a male nilgai in the Museum of the Royal College of Surgeons (No. 1347).

Distinctness and affinities.—The foregoing comparisons indicate that the Siwalik nilgai was closely allied to the existing species, but that it exhibited slight differences which may be of specific value. With regard to *B. namadicus* (Rüt.[1]), it unfortunately happens that that species is described on the evidence of crania without the teeth, so that it is impossible to institute a comparison between the Siwalik and Narbada forms. There are in the Indian Museum some teeth of the genus from the pleistocene of the Pemganga valley, which probably belong to *B. namadicus*; but they have not been compared with those of the Siwalik form. Under those circumstances it is impossible to say whether the latter is specifically distinct from *B. namadicus*, and it is, therefore, inadvisable to give it a separate name.[2]

Distribution.—Remains of this species are of common occurrence in the Siwaliks of the Punjab; and one specimen has been obtained from the typical Siwalik Hills.

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[1] *Op. cit*

[2] It may be observed that the molars of the present species present a superficial resemblance to those of *Cervus triplidens* (vol I., pl. VIII, figs 1, 2), both forms being markedly hypsodont The molars of *Boselaphus* are, however, readily distinguished by the lesser development of the costæ (especially the median costa of the hind lobe), and by the circumstance that on its outer surface the crown of each tooth is much wider near its summit than at its 'neck'

GENUS: ALCELAPHUS, Blainville.

Species: ALCELAPHUS PALÆINDICUS (Falc.).

Syn. *Antilope palæindica*, Falconer.

Generic determination.—Prof. Rütimeyer[1] has shown that the so-called *Antilope palæindica*,[2] Falc., is closely allied to the African bonte-bok and bless-bok, and may be referred to the same genus. Prof. Rütimeyer retains the genus *Damalis* for the living species; but in Prof. Flower's classification they are included in *Alcelaphus*, and the fossil form will accordingly be termed *Alcelaphus palæindicus*.

This identification affords another instance of the intimate connection between the Indian and African faunas.

FAMILY: *TRAGULIDÆ*.

GENUS: TRAGULUS, Pallas (*ex* Brisson).

Distribution, etc.—With the exception of the form described below this genus has not been recorded in the fossil condition[3]; although it is probable that the allied *Hyomoschus* is represented by *Dorcatherium* of the Eppelsheim beds and Siwaliks.[4] The living species are confined to Wallace's Oriental region, and comprise *T. javanicus* (Gmelin),[5] of Java, etc.; *T. kanchil* (Raffles), of Java, Tennasserim, etc.; *T. meminna* (Erxl.), of India; *T. napu* (F. Cuv.), of Sumatra, and *T. stanleyanus* (Gray), of Java. In the trenchant form of the earlier upper premolars[6] the genus is markedly distinct from the cervine ruminants. Next to *Hyomoschus*, according to Prof. Rutimeyer, the nearest ally of *Tragulus* is *Prodremotherium*,[7] Filhol, and it is connected by the latter with *Gelocus*, Kow., and so with *Cænotherium*. By many writers[8] the genera *Dremotherium*, E. Geoffr., and *Amphitragulus* are considered to be closely allied to the chevrotains; but they are placed by Prof. Rütimeyer nearer to *Cervus*.

Species: TRAGULUS SIVALENSIS, *nobis*.

History.—In 1882 the present writer[9] gave a preliminary notice of an upper preorbital fossa, and the commencement of the larmial vacuity, characteristic of the deer; whence the specimen may be safely referred to that group. On the right side all the cheek-teeth are preserved, with the exception of pm. 2; a part of the outer side of pm. 3 and m. 3 is broken away; and the teeth are about one-third worn. The true molars agree with the little-worn type molars of *C. simplicidens* (vol. I., pl. VIII., fig. 3), with the exception that the accessory columns in the median valleys are more strongly developed; this cannot, however, in all probability be regarded as more than an individual variation, and the present specimen may accordingly be referred to that species.

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[1] "Die Rinder der Tertiär-Epoche" ('Abh schweiz pal Gesel,' 1877-8), pp 88-9

[2] "Pal Mem," vol I, pl XXIII

[3] Unless *Moschus meyeri*, Goldf, belong to it

[4] In a recent memoir, "Beiträge zu der Geschichte der Hirsch-familie" ('Abhand schweiz pal Ges,' 1883), pp 70-78, Prof Rütimeyer apparently comes to the conclusion that the genera *Dorcatherium* and *Hyæmoschus* should be united The former name (Kaup, 1836) has the priority over the latter (Gray, 1845) but it is doubtful if zoologists would accept the substitution of *Dorcatherium* as the name of the genus For the so-called *Dorcatherium naui*, Kaup, Rutimeyer adopts the name *Hyæmoschus crassus*, Lartet but the specific name *naui* has the priority (1836), *crassus* having been applied in 1851 (*Dorcocerus crassus*, Lartet) The generic characters of *Dorcatherium* given in the first volume of the present work are incorrect

[5] Crania of several species are figured by Milne-Edwards in "Recherches sur la Famille des Chevrotains,"—'Ann Sci Nat' Zool, 5th ser, vol II, pls VIII, IX, X (1864), where the synonomy is also given

[6] Prof Rütimeyer (*op cit*) employs the terms *heterodont* and *homœodont* for these two types of selenodont dentition, since, however, the same terms are applied in a much wider sense to the mammalian dentition their employment in the former sense is inadvisable

[7] For the characters of this and allied genera see Filhol, "Phosphorites du Quercy," p 448, *et seq*, and "Mam Foss de Ronzon," p 240, *et seq* (reprints)

[8] See Milne-Edwards, *op cit*, pp 148-9

[9] "Records," vol XV, p 30

In size the specimen agrees very closely with the Indian *C. duvaucelli*,[1] Cuv.; but is distinguished by its more 'hypsodont' character, and the less strongly developed costæ of the molars. In both these respects the fossil is exceedingly close to *C. axis*; which is more hypsodont than the majority of the family.[2] This hypsodont character is well shown in the woodcut, where the 'necks' of the crowns of the true molars occupy very different levels, as in *C. axis*.[3] With the exception of their considerably larger size, the only difference that can be detected between the teeth of the fossil and those of *C. axis* is that pm. 3 is relatively shorter in the latter, and the outer part of pm. 4 rather less symmetrical, and the true molars relatively wider. The following dimensions indicate the difference in the size and proportions of the fossil and recent forms:—

	C. sivalensis.	C. axis.
Width of intermolar space at m. 1	2·08	1·85
Interval between outer surfaces of second molars	3·76	3·15
Length of five cheek-teeth	3·48	2·74
,, ,, three true molars	2·4	2·04
,, ,, pm. 3	0·68	0·45
,, ,, m. 2	0·88	0·82
Width ,, ,, ,,	0·94	0·72

Distinctness and affinities.—It does not appear that there is any other species of deer of which the teeth approach so closely to *C. simplicidens* as do those of *C. axis*; and it, therefore, seems probable that the former should be regarded as an ancestral form of the latter. There seem no valid grounds for referring any of the mandibles or antlers of the Siwalik deer to the present species.

Distribution.—Both the specimens referred to this species were obtained from the Punjab.

Species 2: CERVUS TRIPLIDENS, *nobis.*

History.—This species was founded at the same time as the last.[4]

Upper molars.—The type second and third upper molars are figured in vol. I., pl. VIII., figs. 1, 2, and their dimensions are given on page 68. These teeth are but little worn; and from their general structure, and especially the strongly marked costæ on their outer surfaces, there seems no doubt but that the generic reference is correct. They are distinguished from those of *C. simplicidens* by their still higher crowns (the height of m. 3 exceeding its width), and the more strongly marked costæ on their outer surfaces; this hypsodont character being well exhibited by the extreme inequality in the degree of protrusion of m. 2 and m. 3.

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[1] In the original description the fossil species was considered to be allied to this species.

[2] *Vide* Flower, Article "Mammalia," p. 432 in the 'Encyclopædia Britannica,' 9th ed.

[3] In the more 'brachydont' forms (*e.g. Cervus duvaucelli*, and still more *C. kashmirianus*) the 'necks' of the true molars occupy nearly the same line (*vide* Flower, *loc. cit.*).

[4] Vol. I., p. 67 (1876). The remark as to the shallowness of the median enamel pits is incorrect.

The species of deer apparently nearest to the fossil is *C. davidianus* (A. Milne-Edwards[1]), of North China, which seems to be more hypsodont than any other living species, and whose molars have very strongly marked costæ. The remains of the Siwalik form are not sufficiently complete to indicate its exact relations to the living species, but there is every probability that the two were more or less intimately allied.

Distribution.—The type specimens and perhaps a part of a maxilla in the Indian and another in the British Museum are the only ones that can be referred to the species[2]; the former were obtained from the Punjab, and the latter from the Siwalik Hills.

Species 3: CERVUS SIVALENSIS, *nobis*.

History.—In the original description of *Cervus triplidens*[3] it was stated that two lower molars of a *Cervus* figured in vol. I., pl. VIII., fig. 5, might possibly belong to that species; but it was stated in the preface to the same volume[4] that this conjectural reference was incorrect, and the name *C. sivalensis* was proposed for the species to which the lower teeth belonged; this name having been subsequently quoted in a list of Siwalik mammals.[5]

Upper molars.—As the previous species have been determined from the characters of the upper molars, it is desirable that the same should be done with the present species, and accordingly two upper molars have been taken as the type, which are so similar to the above-mentioned lower molars that they evidently belonged to a closely allied, if not specifically identical form. These two teeth, the least worn of which is represented in the accompanying woodcut (fig. 8), are implanted in a fragment of the left maxilla, from the Siwalik Hills, presented to the British Museum by Mr. C. Falconer. The 'necks' of the two teeth are placed on the same line, which indicates a more 'brachydont' form than either of the two preceding species; but the much-worn condition of the present teeth forbids a more exact comparison in this respect. The present teeth are also distinguished by the more rugose character of their enamel, which approaches that of the giraffe; and by the presence of a distinct cingulum.

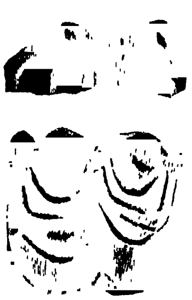

Fig. 8. *Cervus sivalensis, nobis*. Last left upper true molar; from the Siwalik Hills. British Museum (No 48,440).

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[1] 'Nouv. Arch. d. Mus.,' Bulletin, vol II, p. 27 (1866). The teeth figured are very much worn: a skeleton in the British Museum shows them in an early condition of wear.

[2] In the original description mention is made of part of a mandible: this, however, belongs to another species.

[3] Vol. I, p. 68.

[4] Page xvii.: the name *C. simplicidens* is erroneously given in place of *C. triplidens*.

[5] "Records," vol. XVI., p. 83 (1883).

In size these teeth agree very closely with those of *C. duvaucelli*; and they also agree in the contour of their outer surface, and in the flatness of their masticating surface[1]; but differ by the more rugose enamel, the distinct cingulum, and the smaller size of the accessory inner column.

Lower molars.—The lower molars mentioned above are represented in vol. I., pl. VIII., fig. 5: they are the two last teeth of the right side, in a well-worn condition, and were obtained from the Siwaliks of the Punjab. They agree with the upper molars in their short crowns, rugose enamel, size, and the flatness of the masticating surface of the crown when well worn ($\overline{\text{m. 2}}$).

Affinities.—The present specimens are insufficient to determine the full affinities of the species to which they belonged; and as the writer has not an opportunity of comparing them with the teeth of all species of the genus their specific distinctness cannot be insisted on; so that the name *C. sivalensis* must be regarded as provisional. Their interest lies in the fact of their proving the existence of a third species of Siwalik deer, and thus showing that the group was strongly represented in that period.[2]

Distribution.—The remains noticed above were obtained from the Siwalik Hills and the Punjab.

SYNOPSIS OF SIWALIK AND NARBADA MAMMALIA.

Introductory.—The present synopsis includes all the specifically named mammals from the Siwaliks and Narbadas (together with *Rhinoceros deccanensis*), and the best defined of the unnamed forms.

The hope expressed in Prof. Flower's recently published Catalogue of the Mammalia in the Museum of the Royal College of Surgeons[3] that the generic and specific names therein employed might receive general adoption has induced the present writer to follow in the main that nomenclature; and it has accordingly been necessary to change some of the names employed in the earlier parts of this work. The use of subgeneric names has been entirely abolished; and the writer desires that the names given in the synopsis should be adopted for the future. The reference to each genus indicates the passage in which it was originally named; and in the case of species the first reference indicates the first publication of the name, and the second the place where a fuller description is given: in cases where the naming of a species is coincident with its description but one reference is given. The generic references are in many cases given on the authority of Prof. Flower.

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[1] The molars of the sambar (*C. aristotelis*, Cuv) are slightly larger, and are readily distinguished by the concavity of the middle part of the outer surface of each lobe Those of *C. kashmirianus*, Falc. (which agree very closely with those of *C. elaphus* and *C. canadensis*) are of the same size, but have the costæ less deeply marked, and the worn masticating surface thrown into deep ridges and grooves.

[2] An imperfect Siwalik cranium in the British Museum (No. 39,590) possibly indicates a fourth species of *Cervus*. The molars are brachydont, and are smaller than those of *C. sivalensis*. A fragment of a mandible in the same collection corresponds in size with this cranium.

[3] London, 1884.

The approximate distribution in time of each species is given (as far as it can be determined); but for the distribution in space the reader must refer to the descriptions. In cases where the term 'Siwalik' is used it implies the upper Siwaliks; but in many cases it not improbably includes a part of the lower Siwaliks. The sequence of the orders is that adopted by Prof. Flower in the 'Proc. Zool. Soc.,' 1883[1], with the exception that the series is arranged from the highest to the lowest.

The dates have been gone through with great care, and in some cases amendments have been made on those previously given. Some emendations have also been made in the authorities for certain species.

CLASS Mammalia.

ORDER Primates.

SUB-ORDER ANTHROPOIDEA.

FAMILY *SIMIIDÆ.*

Genus PALÆOPITHECUS, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XII., p. 33, (1879).

PALÆOPITHECUS SIVALENSIS, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XII., p. 33, (1879).
Siwalik.

FAMILY *CERCOPITHECIDÆ.*

Genus SEMNOPITHECUS, F. Cuv.

"Hist. Nat. des Mammifères," (1821), *(Semnopithèque).*

SEMNOPITHECUS PALÆINDICUS, Lyd.[2]

The name is applied here for the first time.
"Palæontological Memoirs," vol. I., pl. XXIV., figs. 5, 6, 7, 8.
Siwalik.

Genus MACACUS, Desm.

"Mammalogie" p. 63 (1820).

MACACUS SIVALENSIS, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XI., p. 70, (1878).
Siwalik.

Genus CYNOCEPHALUS, Lacépède.

"Nouv. Tab. Meth." (1799), in 'Mem. d. l'Institute,' vol. III., p. 490 (1801).

CYNOCEPHALUS SUBHIMALAYANUS, (H. Meyer).

Syn. *Semnopithecus subhimalayanus*, H. Meyer.
In Bronn's "Index Palæontologicus," p. 1133, (1848).
"Palæontological Memoirs," vol. I., pl. XXIV., figs. 1, 2
Siwalik.

CYNOCEPHALUS sp. Lyd.

"Palæontological Memoirs," vol. I., pl. XXIV. figs. 3, 4.
Siwalik.

ORDER Carnivora.

SUB-ORDER Carnivora Vera.

FAMILY *FELIDÆ.*

Genus MACHÆRODUS, Kaup.

"Oss. Foss. de Darmstadt," pt 2, p. 24 (1833) (*Machairodus*).

MACHÆRODUS SIVALENSIS, (Falc. and Caut.)

Syn. *Drepanodon sivalensis*, Falc. and Caut.
"Palæontological Memoirs," vol. I., p. 550 (1868).
Supra, vol. II., p. 334.
Siwalik.

MACHÆRODUS PALÆINDICUS, Bose.

'Quart. Journ. Geol. Soc.,' vol. XXXVI., p. 125 (1880).
Supra, vol. II., p. 341.
Siwalik.

Genus FELIS,[3] Linn.

"Syst. Nat.," ed. 12, vol. I., p. 61 (1766).

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[1] Page 178.

[2] The reasons for assigning this form to *Semnopithecus*, and the two succeeding forms to *Cynocephalus* will be given in the forthcoming Catalogue of the Fossil Mammalia in the British Museum, by the present writer.

[3] A large unnamed feline occurs in the Narbadas; *vide supra*, vol. II., p. 346.

FELIS CRISTATA, Falc. and Caut.

Syn. *F. grandicristata*, Bose.

"Asiatic Researches," vol. XIX., p. 135 (1836).
Supra, vol. II., p. 320.
Siwalik.

FELIS (? CYNÆLURUS) BRACHYGNATHUS, Lyd.

Supra, vol. II., p. 326, (1884).
Siwalik.

FELIS, sp. Lyd. (allied to *F. pardus*).

Supra, vol. II., p. 328 (1884).
Siwalik.

FELIS, sp., Lyd. (allied to *F. lynx*).

Supra, vol. II., p. 329 (1884).
Siwalik.

FELIS SUBHIMALAYANA, Bronn.

In Bronn's "Index Palæontologicus," p. 492 (1848).
Supra, vol. II., p. 330.
Siwalik.

Genus ÆLUROGALE, Filhol.

'Bibliothèque des Hautes Études,' vol. XVI., p. 39 (1877).

ÆLUROGALE SIVALENSIS, Lyd.

Syn. *Pseudælurus sivalensis*, Lyd.

'Rec. Geol. Surv. Ind.,' vol. X., p. 83 (1877).
Supra, vol. II., p. 317.
Siwalik.

Genus ÆLUROPSIS, Lyd.

Supra, vol. II., p. 316 (1884).

ÆLUROPSIS ANNECTANS, Lyd.

Supra, vol. II., p. 316 (1884).
Siwalik.

FAMILY *HYÆNIDÆ*.

Genus HYÆNA, Zimm.[1]

"Specimen Zoologiæ Geographicæ," p. 365 (1777).

HYÆNA FELINA, Bose.

"Quart. Journ. Geol. Soc.,' vol. XXXVI., p. 130 (1880).
Supra, vol, II., p. 278.
Siwalik.

HYÆNA COLVINI, Lyd.

Supra, vol. II., p. 290 (1884).
Siwalik.

HYÆNA SIVALENSIS, Bose.[2]

'Quart. Journ. Geol. Soc.,' vol. XXXVI., p. 128 (1880).
Supra, vol. II., p. 303.
Siwalik.

HYÆNA MACROSTOMA, Lyd.

Supra, vol. II., p. 298 (1884).
Siwalik.

HYÆNA, sp., Lyd.

Supra, vol. II., p. 309.
Siwalik.

Genus LEPTHYÆNA, Lyd.

Supra, vol. II., p. 312 (1884).

LEPTHYÆNA SIVALENSIS, Lyd.

Syn. *Ictitherium sivalense*, Lyd.

'Rec. Geol. Surv. Ind.,' vol. X., p. 32 (1877).
Supra, vol. II., p. 312.
Siwalik.

FAMILY *VIVERRIDÆ*.

Genus VIVERRA, Linn.

"Syst. Nat.," ed. 12, vol. I., p. 63 (1766).

VIVERRA BAKERI, Bose.

"Quart. Journ. Geol. Soc.,' vol. XXXVI., p. 131 (1880.)
Supra, vol. II., p. 268.
Siwalik.

VIVERRA DURANDI, Lyd.

Supra, vol. II. p. 271 (1884).
Siwalik.

FAMILY *URSIDÆ*.

SUB-FAMILY *CANINÆ*.

Genus CANIS, Linn.

"Syst. Nat.," ed. 12, vol. I., p. 56, (1766).

CANIS CAUTLEYI, Bose.

'Quart. Journ. Geol. Soc.' vol. XXXVI., p. 135 (1880).
Supra, vol. II., p. 259.
Siwalik.

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[1] Given in vol II. with the pre-Linnean authority of Brisson.

[2] The name *H. sivalensis*, Falc. and Caut., also occurs; but it has been advisable that it should be dropped.

CANIS CURVIPALATUS, Bose.

'Quart. Journ. Geol. Soc.,' vol. XXXVI., p. 134 (1880).
Supra, vol. II., p. 253.
Siwalik.

Genus AMPHICYON, Lartet.

'Comptes Rendus,' vol. V., p. 424 (1837).

AMPHICYON PALÆINDICUS, Lyd.

Supra, vol. I., p. 84 (1876).
Ibid., vol. II., p. 248.
Low. (and ? up.) Siwalik.

SUB-FAMILY *URSINÆ.*

Genus HYÆNARCTOS, Falc. and Caut.

In Owen's "Odontography," p. 505 (1840-45).

HYÆNARCTOS PALÆINDICUS, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XI., p. 104 (1878).
Supra, vol. II., p. 232.
Siwalik.

HYÆNARCTOS PUNJABIENSIS, Lyd.

Supra, vol. II., p. 226 (1884)
Siwalik.

HYÆNARCTOS SIVALENSIS, Falc. and Caut.

Syn. *Ursus sivalensis*, Falc. and Caut.

'Asiatic Researches,' vol. XIX., p. 193 (1836).
Siwalik.

Genus URSUS, Linn.

"Syst. Nat.," ed. 12, vol. I., p. 69 (1766).

URSUS NAMADICUS, Falc. and Caut.

"Palæontological Memoirs," vol. I., p. 552 (1868).
Supra, vol. II. p. 216.
Narbada.

URSUS THEOBALDI, Lyd.

Supra, vol. II., p. 211, (1884).
Siwalik.

FAMILY *MUSTELIDÆ.*

Genus MUSTELA, Linn.

"Syst. Nat.," ed. 12, vol. I p. 66 (1766).

MUSTELA, sp., Lyd.

"Catalogue of Fossil Mammalia in British Museum" (*in preparation*).
Siwalik.

Genus MELLIVORA, Storr.

"Prodromus Method Mam.," p. 34 (1780).

MELLIVORA SIVALENSIS, (Falc. and Caut.)

Syn. *Ursitaxus sivalensis*, Falc. and Caut.

"Palæontological Memoirs," vol. I., p. 553 (1868).
Supra, vol. II., p. 180.
Siwalik.

MELLIVORA PUNJABIENSIS, Lyd.

Supra, vol. II., p. 183 (1884).
Siwalik.

Genus MELLIVORODON, Lyd.

Supra, vol. II., p. 185 (1884).

MELLIVORODON PALÆINDICUS, Lyd.

Supra, vol. II., p. 185 (1884).
Siwalik

Genus LUTRA, Erxl. (*ex* Ray).

"Syst. Regn. Animal," p. 445 (1777).

LUTRA PALÆINDICA, Falc. and Caut.

"Palæontological Memoirs," vol. I., pl. XXVII (1868).
Supra, vol. II., p. 190.
Siwalik.

LUTRA BATHYGNATHUS, Lyd.

Supra, vol. II., p. 193 (1884).
Siwalik.

LUTRA SIVALENSIS, (Falc. and Caut.)

Syn. *Enhydriodon sivalensis*, Falc. and Caut.

"Palæontological Memoirs," vol. I., p. 552 (1868).
Supra, vol. II., pp. 195, 351.
Siwalik.

FAMILY *HYÆNODONTIDÆ.*

Genus HYÆNODON, Laizer and Parieu.

'Comptes Rendus,' vol. VII., p. 442 (1838).

HYÆNODON INDICUS, Lyd.

Supra, vol. II., p. 348 (1884).
Siwalik.

Order Rodentia.

Sub-Order Simplicidentata.

Family *MURIDÆ.*

Genus MUS, Linn.

" Syst. Nat.," ed. 12, vol. I., p. 83 (1766).

Mus (?) sp., Falc. and Caut.

'Journ. As. Soc. Beng.,' vol. IV., p. 706 (1835).

A fragment of a mandible with m. 1 in the British Museum[1] (No. 16,529a) belongs to this or an allied genus: it is about equal in size to the mandible of *Cricetus frumentarius.*

Siwalik.

Family *SPALACIDÆ.*

Genus RHIZOMYS, Gray.

'Proc. Zool. Soc.,' 1831, p. 95.

Rhizomys sivalensis, Lyd.

Syn. (?) *Typhlodon*, Falc.

'Rec. Geol. Surv. Ind.,' vol. XI., p. 101 (1878).

Supra, vol. III., p. 106.

Siwalik.

Family *HYSTRICIDÆ.*

Genus HYSTRIX, Linn.

" Syst. Nat.,'" ed. 12, vol. I., p. 76 (1766).

Hystrix sivalensis, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XI., p. 100 (1878).

Supra, vol. III., p. 109.

Siwalik.

Sub-Order Duplicidentata.

Family *LEPORIDÆ.*

Genus LEPUS, Linn.

" Syst. Nat.," ed. 12, vol. I., p. 77 (1766).

A minute fragment of a mandible in the British Museum (No. 16,529) belongs to this genus.

Siwalik.

Order Ungulata.

Sub-Order Artiodactyla.

Section RUMINANTIA.

Family *BOVIDÆ.*

Genus BOS, Linn.

" Syst. Nat.,' ed. 12, vol. I., p. 98 (1766).

Bos namadicus, Falc.

" Catalogue of Fossil Vertebrata of Asiatic Society of Bengal," p. 232 (1859).

Supra, vol. I., p. 95.

Narbada.

Bos acutifrons, Lyd.

'Rec. Geol. Surv. Ind.,' vol. X., p. 30 (1877).

Supra, vol. I., pp. 112, 173.

Siwalik.

Bos planifrons, Lyd.

'Rec. Geol. Surv. Ind.,. vol. X., p. 30 (1877).

Supra, vol. I., pp. 109, 173.

Siwalik.

Bos platyrhinus, Lyd.

Supra, vol. I., p. 119 (1878).

Siwalik.

(The distinctness of this form is somewhat doubtful.)

Genus BISON, H. Smith.

In Griffith's "Animal Kingdom," vol. V., p. 373 (1827).

Bison sivalensis (Falc.).

Syn. *Bos sivalensis*, Falc.

"Palæontological Memoirs," vol. I., p. 555 (1868)

Supra, vol. I., p. 122. (The specimen described is identified with Falconer's specimen on the evidence of a drawing in the British Museum.)

Siwalik.

Genus Bubalus, Hamilton Smith.

In Griffith's "Animal Kingdom," vol. V., p. 371 (1827).

Bubalus palæindicus (Falc.).

Bos palæindicus, Falc.

" Catalogue of Fossil Vertebrata of Asiatic Society of Bengal," p. 230 (1859).

Supra, vol. I., p. 132.

Narbada, and highest Siwalik.

Bubalus platyceros, Lyd.

Syn. *Bubalus sivalensis*, Rüt.

'Rec. Geol. Surv. Ind.,' vol. X., p. 31 (1877).

Supra, vol. I.. pp. 127, 173.

Siwalik.

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[1] This specimen, as well as the one referred to *Lepus*, did not come under the writer's notice until the memoir on rodents was printed.

Genus HEMIBOS,[1] Falc. and Caut.

Syn. *Amphibos*, Falc. and Caut.; *Peribos*, Lyd.; *Probubalus*, Rüt.

" Palæontological Memoirs," vol. I., p. 546 (1868).
Supra, vol. I., pp. 145, 174.

Hemibos occipitalis (Falc.).

Syn. *Bos occipitalis*, Falc. *Hemibos triquetriceros*, Falc. and Caut. *Peribos occipitalis*, Lyd. *Probubalus triquetricornis*, Rüt.

" Palæontological Memoirs," vol. I., p. 280 (1868).
Supra, vol. I., pp. 141, 174.
Siwalik.

Hemibos acuticornis (Falc. and Caut.).

Syn. *Amphibos acuticornis*, Falc. and Caut.

" Palæontological Memoirs," vol. I., p. 547 (1868).
Supra, vol. I., p. 176.
Siwalik.

Hemibos antilopinus (Falc. and Caut.).

Syn. *Amphibos antilopinus*, Falc. and Caut. *Probubalus antilopinus*, Rüt.

" Palæontological Memoirs," vol. I., p. 280 (1868).
" Die Rinder der Tertiär-Epoche," p. 135, in "Abh. Schweiz. pal. Gesel," vol. V. (1878).
Siwalik.

Genus LEPTOBOS, Rüt. (*ex* Falc., MSS.)

" Die Rinder der Tertiär-Epoche," p. 157, in 'Abh. Schweiz. pal. Gesel,' vol. V. (1878).

Leptobos falconeri, Rüt.

" Die Rinder der Tertiär-Epoche," p. 157, in 'Abh. Schweiz. pal. Gesel,' vol. V. (1878).
Siwalik.

Leptobos frazeri, Rüt.

" Die Rinder der Tertiär-Epoche," p. 165, in 'Abh. Schweiz. pal. Gesel,' vol. V. (1878).
Narbada.

Genus BUCAPRA, Rüt.

" Die Rinder der Tertiär-Epoche," p. 105, in 'Abh. Schweiz. pal. Gesel,' vol. V. (1878).

Bucapra daviesi, Rüt.

" Die Rinder der Tertiär-Epoche," p. 105, in 'Abh. Schweiz. pal. Gesel,' vol. V. (1878).
Siwalik.

Genus CAPRA, Linn.

" Syst. Nat.,' ed. 12, vol. I., p. 94 (1766).

Capra sivalensis, Lyd.

Supra, vol. I., p. 169 (1878).
Siwalik.

Capra perimensis, Lyd.

Supra, vol. I., p. 170 (1878).
Siwalik.

Capra, sp., Lyd.

Supra, vol. I., p. 171 (1878).
Siwalik.

Genus OREAS, Desmarest.

" Mammalogie," p. 471 (1822).

Oreas (?) latidens, Lyd.

Syn. *Cervus latidens*, Lyd.

Supra, vol. I., p. 65 (1876).
Ibid, vol. III., p. 111.
Siwalik.

Genus PALÆORYX, Gaudry.

' Comptes Rendus,' vol. LII., p. 238 (1861).

Palæoryx (?) sp., Lyd.

Supra, vol. III., p. 114 (1884).
Siwalik.

Genus BOSELAPHUS, Blainville.

Syn. *Portax*, H. Smith.

' Bull. Soc. Philom. Paris,' 1816, p. 75.

Boselaphus namadicus (Rüt.).

Syn. *Portax namadicus*, Rüt.

" Die Rinder der Tertiär-Epoche," p. 89 in 'Abh. Schweiz. pal. Gesel," vol. V. (1878).
Narbada.

Boselaphus, sp., Lyd.

Supra, vol. III., p. 114 (1884).
Siwalik.

Genus GAZELLA, Blainville.

' Bull. Soc. Philom. Paris,' 1816, p. 75,

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[1] Rütimeyer considers the type species generically identical with the anoa, which Flower includes in *Bubalus*: it is, therefore, not improbable that *Hemibos* should be merged in that genus.

Gazella porrecticornis, Lyd.

Syn. *Antilope porrecticornis*, Lyd.

Supra, vol. I., p. 158 (1878).
Siwalik.

Genus ANTILOPE, Pallas.

"Spicilegia Zoologica," vol. I., p. 3 (1767).

Antilope sivalensis, Lyd.

Supra, vol. I., p. 154 (1878).
Siwalik.

Antilope (?) patulicornis, Lyd.

Supra, vol. I., p. 157 (1878).
Siwalik.

Genus ALCELAPHUS, Blainville.

'Bull. Soc. Philom. Paris,' 1816, p. 75.

Alcelaphus palæindicus (Falc.)

Syn. *Antilope palæindica*, Falc.

"Catalogue of Fossil Vertebrata of Asiatic Society of Bengal," p. 154 (1859).
"Palæontological Memoirs," vol. I., pl. XXIII.
Supra, vol. III., p. 117.
Siwalik.

Family *GIRAFFIDÆ*.

Syn. *Camelopardalidæ*.

Genus SIVATHERIUM, Falc. and Caut.

'Asiatic Researches,' vol. XIX., p. 1 (1836).

Sivatherium giganteum, Falc. and Caut.

'Asiatic Researches,' vol. XIX., p. 1 (1836).
Supra, vol. II., p. 131.
Siwalik.

Genus BRAMATHERIUM, Falc.

'Quart. Journ. Geol. Soc.,' vol. I., p. 363 (1845).

Bramatherium perimense, Falconer.

'Quart. Journ. Geol. Soc.,' vol. I., p. 365 (1845).
Supra, vol. II., p. 130.
Siwalik.

Genus HYDASPITHERIUM, Lyd.

'Rec. Geol. Surv. Ind.,' vol. IX., p. 154 (1876).
(*Hydaspidotherium*).

Hydaspitherium megacephalum, Lyd.

'Rec. Geol. Surv. Ind.,' vol. IX., p. 154 (1876).
Supra, vol. I., p. 159, vol. II, p. 118.
Siwalik.

Hydaspitherium grande, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XI., p. 91 (1878).
Supra, vol. II., p. 126.
Siwalik.

Genus HELLADOTHERIUM, Gaudry.

'Comptes Rendus,' vol. LI, p. 802 (1860).

Helladotherium duvernoyi (Gaud. & Lart.)

Syn. *Camelopardalis duvernoyi*, Gaud. & Lart.

'Comptes Rendus,' vol. XLIII., p. 271 (1856).
Supra, vol. II., p. 116.
Siwalik, and Pikermi beds.

Genus VISHNUTHERIUM, Lyd.

'Rec. Geol. Surv. Ind.,' vol. IX., p. 103 (1876).

Vishnutherium iravadicum, Lyd.

'Rec. Geol. Surv. Ind.,' vol. IX., p. 103 (1876).
Supra, vol. I., p. 55, vol. II., p. 112.
Siwalik.

Genus GIRAFFA, Zimmermann.

Syn. *Camelopardalis*,[1] Gmelin (1788).

"Geograph. Geschicte," vol. II., p. 125 (1780).

Giraffa sivalensis (Falc. and Caut.).

Syn. *Camelopardalis sivalensis*, Falc. & Caut.
Camelopardalis affinis, Falc. & Caut.

'Proc. Geol. Soc.,' vol. IV., p. 244 (1843).
Supra, vol. II., p. 103.
Siwalik.

Family *CERVIDÆ*.

Genus PROPALÆOMERYX, Lyd.

Supra, vol. II., p. 173 (1883).

Propalæomeryx sivalensis, Lyd.

Supra, vol. II., p. 173 (1883).
Siwalik.

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[1] Wrongly authenticated in vol. II.

Genus MOSCHUS, Linn.

"Syst. Nat.," ed. 12, vol. I., p. 91 (1766).

MOSCHUS (?) sp., Lyd.

Supra, vol. III., p. 118 (1884).
Siwalik.

Genus CERVUS,[1] Linn.

"Syst. Nat.," ed. 12, vol. I., p. 92 (1766).

CERVUS TRIPLIDENS, Lyd.

Supra, vol. I., p. 67 (1876).
Ibid, vol. III., p. 120.
Siwalik.

CERVUS SIMPLICIDENS, Lyd.

Supra, vol. I., p. 69 (1876).
Ibid, vol. III., p. 119.
Siwalik.

CERVUS SIVALENSIS, Lyd.

Supra, vol. I., p. xvii. (1880).
Ibid, vol. III., p. 121.
Siwalik.

CERVUS, sp.

'Rec. Geol. Surv. Ind.,' vol. XVI., p. 79 (1883).
(? *Cervus duvaucelli*, Cuv.)
Narbada.

FAMILY *TRAGULIDÆ.*

Genus DORCATHERIUM, Kaup.

Syn. *Hyomoschus*, Gray (*teste* Rüt.).

"Oss. Foss. de Darmstadt," pt. 5, p. 92 (1836).

DORCATHERIUM MAJUS, Lyd.

Supra, vol. I., p. 62 (1876).
Siwalik.

DORCATHERIUM MINUS, Lyd.

Supra, vol. I., p. 64 (1876).
Siwalik.

Genus TRAGULUS, Pallas (*ex* Brisson).

"Spicilegia Zoologica," vol. XIII., p. 27 (1779).

TRAGULUS SIVALENSIS, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XV., p. 30 (1882).
Supra, vol. III., p. 117.
Siwalik.

FAMILY *CAMELIDÆ.*

Genus CAMELUS, Linn.

"Syst. Nat.," ed. 12, vol. I., p. 90 (1766).

CAMELUS SIVALENSIS, Falc. and Caut.

'Asiatic Researches,'[2] vol. XIX., p. 120 (1836).
Supra, vol. I., p. 61.
Siwalik.

Section SUINA.

Sub-Section *SELENODONTIA.*

FAMILY *MERYCOPOTAMIDÆ.*

Genus MERYCOPOTAMUS, Falc. & Caut.

"Fauna Antiqua Sivalensis," pt. 7, pl. LXII. (1847).

MERYCOPOTAMUS DISSIMILIS, Falc. & Caut.

Syn. *Hippopotamus dissimilis*, Falc. and Caut.
Merycopotamus sivalensis, Falc. and Caut.

'Asiatic Researches,' vol. XIX., p. 51 (1836).
Supra, vol. II., p. 164.
Siwalik.

Genus CHÆROMERYX, Pomel.

'Comptes Rendus,' vol. XXVI., p. 687 (1848).

CHÆROMERYX SILISTRENSIS (Pentland).

Syn. *Anthracotherium silistrense*, Pent. (*in parte*)

'Trans. Geol. Soc.,' ser. 2, vol. II., p. 394 (1828).
Supra, vol. II., p. 166.
Siwalik.

Genus HEMIMERYX, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XI., p. 80 (1878).

HEMIMERYX BLANFORDI, Lyd.

Supra, vol. II., p. 167 (1883).
Lower Siwalik.

Genus SIVAMERYX, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XI., p. 80 (1878).

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[1] This generic term is employed in a wide sense.

[2] A second species was named *C. antiquus* in this memoir, but cannot now be identified.

SIVAMERYX SINDIENSIS, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XI., p. 80 (1878).
Supra, vol. II., p. 169.
Lower Siwalik.

FAMILY *OREODONTIDÆ.*

Genus AGRIOCHŒRUS, Leidy.

'Proc. Ac. Nat. Sci. Philad.,' vol. V., p. 121 (1850).

AGRIOCHŒRUS (?) sp., Lyd.

Supra, vol. II., p. 171 (1883).
Lower Siwalik.

FAMILY *ANTHRACOTHERIIDÆ.*

Genus HYOPOTAMUS, Owen.

Syn. *Ancodus*, Pom. *Bothriodon*, Aymard.
Cyclognathus, Croizet. *Tapinodon*, Meyer.

'Quart. Journ. Geol. Soc.,' vol. IV., p. 103 (1848).[1]

HYOPOTAMUS PALÆINDICUS, Lyd.

'Rec. Geol. Surv. Ind.,' vol. X., p. 77 (1877).
Supra, vol. II., p. 158.
Lower Siwalik.

HYOPOTAMUS GIGANTEUS, Lyd.

Supra, vol. II., p. 160 (1883).
Lower Siwalik.

Genus ANTHRACOTHERIUM, Cuv.

"Ossemens Fossiles," 2nd ed., vol. III., p. 396 (1822).

ANTHRACOTHERIUM HYOPOTAMOIDES, Lyd.

Supra, vol. II., p. 152 (1883).
Lower Siwalik.

ANTHRACOTHERIUM SILISTRENSE, Pentland.

Syn. *A. punjabiense*, Lyd.

'Trans. Geol. Soc.,' ser. 2, vol. II., p. 394 (1828).
Supra, vol. II., p. 149.
Lower and (?) upper Siwalik.

Sub-Section *BUNODONTIA.*

FAMILY *ENTELODONTIDÆ.*

Genus TETRACONODON, Falc.

"Palæontological Memoirs," vol. I., p. 156 (1868)

TETRACONODON MAGNUS, Falc.

"Palæontological Memoirs," vol. I., p. 156 (1868).
Supra, vol. I., p. 79, vol. III., p. 99.
Siwalik.

FAMILY *SUIDÆ.*

Genus HYOTHERIUM, H. von Meyer

"Die fossile Zahne und Knochen von Georgensmünd,' p. 43 (1834).

HYOTHERIUM SINDIENSE, Lyd.

'Rec. Geol. Surv. Ind.,' vol. XI., p. 77 (1878).
Supra, vol. III., p. 95.
Lower Siwalik.

HYOTHERIUM, sp., Lyd.

Supra, vol. III., p. 97 (1884).
Siwalik.

Genus SANITHERIUM, H. von Meyer

"Palæontographica," vol. XV., p. 15 (1865).

SANITHERIUM SCHLAGINTWEITI, H. von Meyer

Syn. *Sus pusillus*, Falc.

"Palæontographica," vol. XV., p. 15 (1865).
Supra, vol. I., p. 76, vol. III, p. 91.
Siwalik.

Genus HIPPOHYUS, Falc. and Caut.

In Owen's "Odontography," p. 562 (1840-5).

HIPPOHYUS SIVALENSIS, Falc. and Caut.

In Owen's "Odontography," p. 562 (1840-5).
Supra, vol. III., p. 85.
Siwalik.

Genus SUS, Linn.

"Syst. Nat.," ed. 12, vol. I., p. 102 (1766).

SUS GIGANTEUS,[2] Falc. and Caut.

"Fauna Antiqua Sivalensis," pt. 8, pl. LXIX. (1847).
Supra, vol. III. p. 52.
Siwalik.

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[1] This paper was read November, 1847, which may stand as the date of the genus.

[2] Prof Forsyth Major ('Quart Journ Geol. Soc,' 1881) is inclined to unite *S. strozzi*, Meneghini, with this species. This identification was made before the publication of the writer's description of *S. giganteus*. The meagre description of *S. strozzi* available to the writer induced him to regard that species as smaller than *S. giganteus*. Should the two be identical, the latter name should stand, the first mention of *S. strozzi* being apparently by Forsyth-Major in 'Atti. Soc. Tosc. Sci. Nat.,' vol. I., p. 39 (1875).

SUS TITAN, Lyd.

Supra, vol. III., p. 59 (1884).
Siwalik.

SUS FALCONERI, Lyd.

Supra, vol. III., p. 66 (1884).
Siwalik.

SUS HYSUDRICUS, Falc. and Caut.

" Fauna Antiqua Sivalensis," pt. 8, pl. LXX. (1847).
Supra, vol. III., p. 77.
Upper and lower Siwalik.

SUS PUNJABIENSIS, Lyd.

' Rec. Geol. Surv. Ind.,. vol. XI., p. 81 (1878).
Supra, vol. III., p. 82.
Siwalik.

SUS, sp., Lyd.

Supra, vol. III., p. 85 (1884).
Narbada.

FAMILY *HIPPOPOTAMIDÆ.*

Genus HIPPOPOTAMUS, Linn.

Including *Hexaprotodon* and *Tetraprotodon*, Falc. and Caut.

" Syst. Nat.," ed. 12, vol. I., p. 101 (1766).

HIPPOPOTAMUS PALÆINDICUS, Falc. & Caut.

" Fauna Antiqua Sivalensis," pt. 7, pl. LVII. (1847).
Supra, vol. III., p. 44.
Narbada.

HIPPOPOTAMUS NAMADICUS, Falc. and Caut.

" Fauna Antiqua Sivalensis," pt. 7, pl. LVII. (1847).
Supra, vol. III., p. 43.
Narbada.

HIPPOPOTAMUS SIVALENSIS, Falc. and Caut.

' Asiatic Researches,' vol. XIX., p. 40 (1836).
Supra, vol. III., p. 37.
Siwalik.

HIPPOPOTAMUS IRAVATICUS, Falc. and Caut.

" Fauna Antiqua Sivalensis," pt. 7, pl. LVII. (1847).
Supra, vol. III., p. 42.
Siwalik.

FAMILY *LISTRIODONTIDÆ.*

Genus LISTRIODON, H. von Meyer.

' Neues Jahrb.,' 1846, p. 466.

LISTRIODON PENTAPOTAMIÆ (Falc.).

Syn. *Tapirus pentapotamiæ*, Falc.

" Palæontological Memoirs," vol. I., p. 415 (1868).
Supra, vol. III., p. 101.
Siwalik.

LISTRIODON THEOBALDI, Lyd.

' Rec. Geol. Surv. Ind.,' vol. XI., p. 98 (1878).
Supra, vol. III., p. 102.
Siwalik.

SUB-ORDER Perissodactyla.

FAMILY *EQUIDÆ.*

Genus EQUUS, Linn.

" Syst. Nat.," ed. 12, vol. I., p. 100 (1766).

EQUUS SIVALENSIS,[1] Falc. and Caut.

" Fauna Antiqua Sivalensis," pt. 9, pl. LXXXI. (1849).
Supra, vol. II., p. 87.
Siwalik.

EQUUS NAMADICUS, Falc. and Caut.

Syn. *E. palæonus*, Falc. and Caut.

" Fauna Antiqua Sivalensis," pt. 9, pl. LXXXI. (1849).
Supra, vol. II., p. 92.
Siwalik and Narbada.

Genus HIPPARION,[2] Christol.

Syn. *Hippotherium*, Kaup.

' Ann. Sci. et Industrie d. Midi d. l. France,' vol. I., p. 180 (1832), *teste* Gervais.

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[1] Prof. Forsyth Major (' Quart. Journ. Geol. Soc.,' 1884) is inclined to identify *E. stenonis*, Cocchi, with this species. Should this be correct, the name *E. stenonis* must be abolished, since it only dates from 1867 (' Mem. Soc. Ital. Sci. Nat.,' vol II., art. 7, p. 14.)

[2] Prof. Flower places this genus in the family *Palæotheriidæ*.

HIPPARION ANTILOPINUM (Falc. and Caut.).

Syn. *Hippotherium antilopinum*, Falc. & Caut.

"Fauna Antiqua Sivalensis," pt. 9, pl. LXXXII. (1849).
Supra, vol. II., p. 75, vol. III., p. 11.
Siwalik.

HIPPARION THEOBALDI, Lyd.

Syn. *Sivalhippus theobaldi*, Lyd.
Hippotherium theobaldi, Lyd.

'Rec. Geol. Surv. Ind.,' vol. X., p. 31 (1877).
Supra, vol. II., p. 81.
Siwalik.

HIPPARION, sp., Lyd.

Syn. *Hippotherium*, sp., Lyd.

Supra, vol. III., p. 14 (1884).
Siwalik.

FAMILY *RHINOCEROTIDÆ.*

Genus RHINOCEROS, Linn.

"Syst. Nat.,' ed. 12, vol. I., p. 104 (1766).

A. Rhinoceros proper.

RHINOCEROS UNICORNIS, Linn.

Syn. *R. indicus*, Cuv. *R. namadicus*, Lyd. (*non.* F. and C.).

"Syst. Nat.,' ed. 12, vol. I., p. 104 (1766).
Supra, vol. I., pp. viii., 32.
Narbada and Recent.

RHINOCEROS SIVALENSIS, Falc. and Caut.

"Fauna Antiqua Sivalensis," pt. 7, pl. LXXIII. (1847).
Supra, vol. II., p. 28.
Upper and lower Siwalik.

Var. *gajensis*, Lyd.

Supra, vol. II., p. 40 (1881).
Lower Siwalik.

RHINOCEROS PALÆINDICUS, Falc. and Caut.

"Fauna Antiqua Sivalensis," pt. 7, pl. LXXIII. (1847).
Supra, vol. II., p. 42.
Siwalik.

B. Atelodus, Pomel.

RHINOCEROS DECCANENSIS, Foote.

Supra, vol. I., p. 1 (1874).
Krishna Valley.

RHINOCEROS PLATYRHINUS, Falc. and Caut.

"Fauna Antiqua Sivalensis," pt. 7, pl. LXXII. (1847).
Supra, vol. II., p. 48.
Siwalik.

C. Position uncertain.

RHINOCEROS NAMADICUS, Falc. and Caut.

"Palæontological Memoirs," vol. I., p. 21 (1868).
Supra, vol. I., p. ix.
Narbada.

Genus ACERATHERIUM, Kaup.

'Oken's Isis,' 1832 (*teste* Gervais[1]).

ACERATHERIUM PERIMENSE (Falc. and Caut.).

Syn. *Rhinoceros* (*A.* ?) *perimensis*, Falc. and Caut. *R. planidens*, and *R. iravadicus*, Lyd.

"Fauna Antiqua Sivalensis," pt. 7, pl. LXXV. (1847).
Supra, vol. II., p. 9.
Siwalik.

ACERATHERIUM BLANFORDI, Lyd.

Supra, vol. III., p. 2 (1884).
Lower Siwalik.

FAMILY *CHALICOTHERIIDÆ.*

Genus CHALICOTHERIUM, Kaup.

"Oss. Foss. de Darmstadt," pt. 2, p. 4 (1833).

CHALICOTHERIUM SIVALENSE, Falc. and Caut.

Syn. *Anoplotherium sivalense*, Falc. and Caut.

'Trans. Geol. Soc.,' ser. 2, vol. V., p. 502 (1837).
"Palæontological Memoirs," vol. I., p. 208.
Upper and lower Siwalik.

SUB-ORDER Proboscidea.

FAMILY *ELEPHANTIDÆ.*

Genus ELEPHAS, Linn.

"Syst. Nat.," ed. 12, vol. I. p. 48 (1766).

A. Elephas proper (*Euelephas*, Falc.)

ELEPHAS NAMADICUS,[2] Falc. and Caut.

"Fauna Antiqua Sivalensis," pt. 2, pl. XIII. (1846).
Supra, vol. I., p. 280.
Narbada.

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[1] The writer has been unable to verify this reference.

[2] Leith Adams is inclined to identify this species with *E. antiquus*, Falc. and Caut. ("Fauna Antiqua Sivalensis, pt. 3, pl. XII. B. [1847]) : the name *E. namadicus* has the priority, and should, therefore, stand in any case.

B. *Loxodon*, Falc.

ELEPHAS PLANIFRONS, Falc. and Caut.

"Fauna Antiqua Sivalensis," pt. 1, pl. II. (1846).
Supra, vol. I., p. 275.
Siwalik.

C. *Stegodon*, Falc.

ELEPHAS INSIGNIS, Falc. and Caut.

Syn. *Mastodon elephantoides*, Clift (*in parte*).
(?) *Stegodon orientalis*, Owen.

"Fauna Antiqua Sivalensis," pt. 1, p. 37, pl. II. (1846).
Supra, vol. I., p. 268.
Siwalik and (?) *Narbada.*

ELEPHAS GANESA, Falc. and Caut.

"Fauna Antiqua Sivalensis," pt. 1, pl. III. (1846).
Supra, vol. I., p. 273.
Siwalik and Narbada.

ELEPHAS BOMBIFRONS, Falc. and Caut.

"Fauna Antiqua Sivalensis," p. 46 (1846).
Supra, vol. I., p. 262.
Siwalik.

ELEPHAS CLIFTI, Falc. and Caut.

Syn. ? *Stegodon sinensis*, Owen.
Mastodon elephantoides, Clift (*in parte*).

"Fauna Antiqua Sivalensis," p. 47 (1846).
Supra, vol. I., p. 256.
Siwalik.

Genus MASTODON, Cuvier.

'Ann. du Mus.,' vol. VIII., p. 270 (1806).

A. *Tetralophodont series.*

MASTODON SIVALENSIS, Caut.

'Journ. As. Soc. Beng.,' vol. V., p. 294 (1836).
Supra, vol. I., p. 248.
Siwalik.

MASTODON PERIMENSIS, Falc. and Caut.

"Fauna Antiqua Sivalensis," pt. 4, pl. XXXIX. (1847).
Supra, vol. I., p. 239.
Siwalik.

B. *Trilophodont series.*

MASTODON PANDIONIS, Falc.

'Quart. Journ. Geol. Soc.,' vol. XIII. p. 319 (1857).
Supra, vol. I., pp. 213, 292, vol. III., p. 29.
Upper and lower Siwalik.

MASTODON ANGUSTIDENS, Cuv.

'Ann. du Mus.,' vol. VIII., p. 412 (1806).
(*Mastodonte à dents étroites.*)

Var. palæindicus, Lyd.

Supra, vol. III., p. 19 (1884).
Lower Siwalik.

MASTODON FALCONERI, Lyd.

'Rec. Geol. Surv. Ind.,' vol. X., p. 83 (1877).
Supra, vol. I., p. 202. vol. III., p. 32.
Upper and lower Siwalik.

FAMILY *DINOTHERIIDÆ.*

Genus DINOTHERIUM, Kaup.

'Oken's Isis,' vol. XXII., p. 401 (1829).

DINOTHERIUM INDICUM,[2] Falc.

'Quart. Journ. Geol. Soc.,' vol. I., p. 361 (1845).
Supra, vol. I., p. 192, vol. II., p. 63, vol. III., p. 34.
Upper (?) *and lower Siwalik.*

DINOTHERIUM PENTAPOTAMIÆ, Lyd. (*ex* Falc.).

Syn. *Antoletherium*, Falc.

Supra, vol. I., p. 72 (1876).
Ibid, p. 183, vol. III., p. 34.
Upper (?) *and lower Siwalik.*

DINOTHERIUM SINDIENSE, Lyd.

Supra, vol. II., pp. 196, 292 (1880).
Ibid., vol. III., p. 34.
Upper (?) *and lower Siwalik.*

ORDER Edentata.

SUB-ORDER Squamata.

FAMILY *MANIDÆ.*

Genus MANIS, Linn.

"Syst. Nat.," ed. 12, vol. I., p. 52 (1766).

MANIS SINDIENSIS, Lyd.

Supra, vol. I., p. 82 (1876).
Lower Siwalik.

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[1] The volume is dated 1829.

[2] This and the two next species have been identified by Weinsheimer with *D. giganteum*, Kaup (*vide supra*, vol. III., p. 34). It is not impossible that *D. indicum* and *D. pentapotamiæ* may belong to one species.

NOTE.

A small collection of fossils from Perim Island has lately come into the writer's hands, among which are some teeth of *Mastodon pandionis* and *M. perimensis*, promising to be of considerable interest. They appear to show that the former (although apparently provided with premolars) exhibits signs of affinity with the Pikermi *M. pentelici*; and also that it is not inprobable that the tetralophodont *M. perimensis* may have been a branch from the trilophodont stock of *M. pandionis.* There are already signs of the connection of the tetro-pentalophodont *M. sivalensis* with the same original stock.

The writer hopes to describe these specimens, and their bearing on the mutual relations of the Siwalik mastodons, in a later part; and in the meantime is extremely anxious to obtain any additional specimens of the teeth and jaws of the mastodons of Sind and Perim Island.

PLATE XIII.

ARTIODACTYLA — *Cervidæ* and *Bovidæ*.

Fig. 1. BOSELAPHUS, sp. The left upper cheek-dentition of a young individual, viewed from the masticating and inner aspect; from the Siwaliks of the Punjab: Indian Museum (No. B. 213).

2. BOSELAPHUS, sp. Part of the left upper dentition of a young individual, viewed from the outer aspect; from the Siwaliks of the Punjab: Indian Museum (No. B. 385).

3. BOSELAPHUS, sp. Part of the right lower cheek-dentition of a young individual; from the Siwaliks of the Punjab: Indian Museum (No. B. 211).

4. BOSELAPHUS, sp. Part of the left lower cheek-dentition of a still younger individual; from the Siwaliks of the Punjab: Indian Museum (No. B. 211).

5. BOSELAPHUS, sp. The left lower true molars of an adult; from the Siwaliks of the Punjab: Indian Museum (No. B. 210).

,, 6. CERVUS SIMPLICIDENS, **Lyd.** The left upper cheek-dentition, viewed from the masticating and inner aspect; from the Siwaliks of the Punjab; Indian Museum (No. B. 519).

,, 7. BOSELAPHUS, sp. First (?) left upper true molar in a well-worn condition, viewed from the masticating and inner aspect; from the Siwaliks of the Punjab: Indian Museum (No. B. 206).

,, 8. BOSELAPHUS, sp. Right upper true molar, in a slightly worn condition, viewed from the outer aspect; from the Siwaliks of the Punjab: Indian Museum (No. B. 205).

,, 9. PALÆORYX (?), sp. Left upper true molar, in a well-worn condition, viewed from the inner and masticating aspect; from the Siwaliks of the Punjab: Indian Museum (No. B. 353).

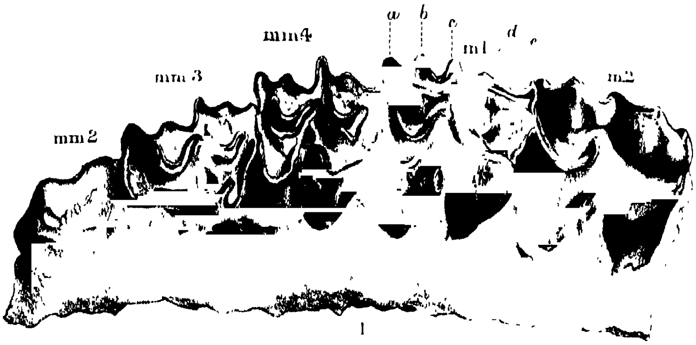
,, 10. Outer aspect of fig. 9.

,, 11. Masticating and inner aspect of fig. 8.

,, 12. OREAS (?) LATIDENS, Lyd. The left upper cheek-dentition, viewed from the outer aspect; from the Siwaliks of the Punjab: Indian Museum (No. B. 218).

,, 13. Inner and masticating aspect of the first three teeth of fig. 12.

All the figures natural size. In figs. 1, 2, the letters a, b, c, d, e, indicate the 'costæ.'



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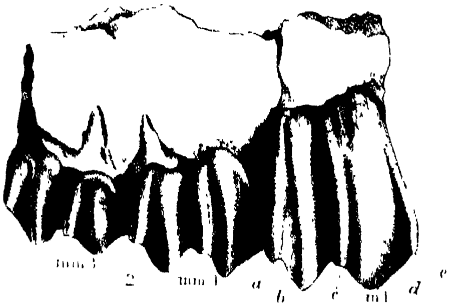

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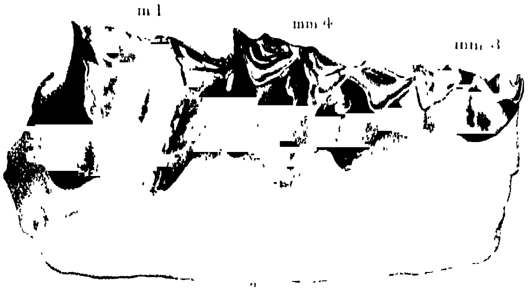

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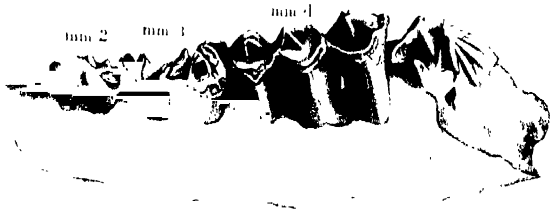

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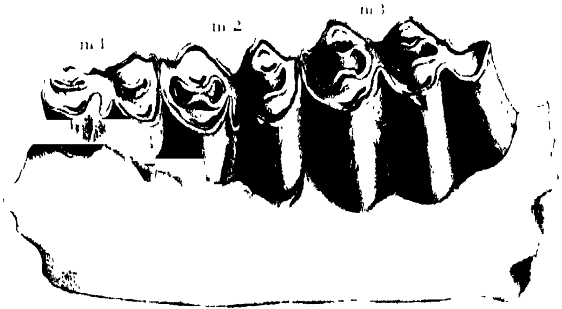

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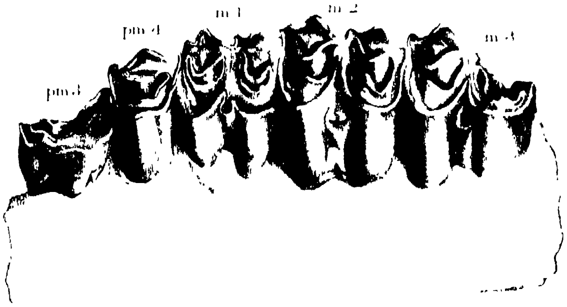

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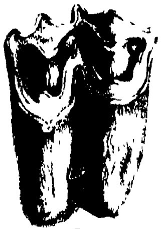

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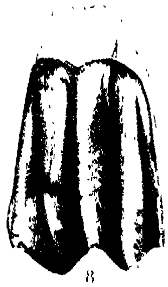

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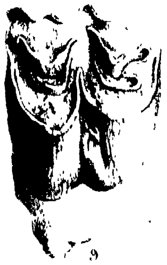

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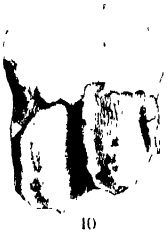

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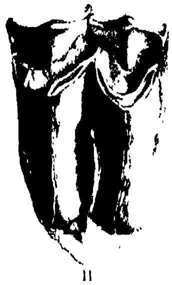

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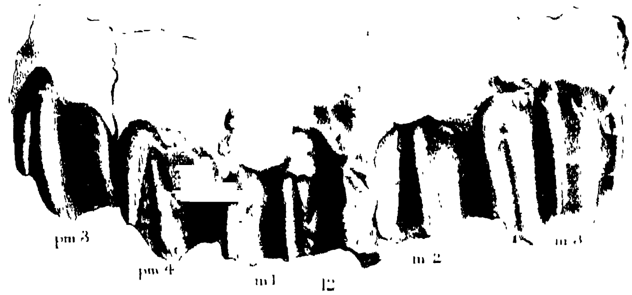

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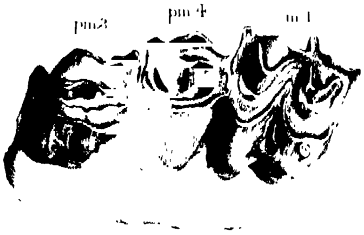

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